gation. On the other hand, recent careful work in France has demonstrated that when the plants are forced to their maximum yield by irrigation the seed thereby suffers a marked deterioration, and that for continued maximum results the seed must be raised on dry soil.

Climate being inviolable and inexorable, what hope is there that the agriculturist shall be emancipated from the tyranny of frost and drought? Clearly, he must attain this by work on the soil and on the plant.

By utilizing vast stores of energy in the form of fuel man banishes the rigors of winter, thus creating artificial conditions of shelter and heat, by aid of which he has supplemented the process of acclimatization. Thus, also, must he cooperate with nature in behalf of the plant; he must combat her malignant aspects by intelligent selection; by scientific methods of culture he must supplement her beneficent efforts on behalf of the human race.

METHODS EMPLOYED IN THE DISTRIBUTION OF WEATHER FORECASTS.

By JAMES BERRY, Chief of Climate and Crop Division.

After making the most accurate prognostications practicable the Weather Bureau has no more important duty than to give them the most extended publicity that its facilities afford.

As with other classes of information the newspapers are the media for most effective work, and as every important newspaper in the country gives prominent place to the weather forecast, a dissemination is obtained so extensive as to be almost incalculable. The cities, towns, and thickly populated communities, through the newspapers have, therefore, not suffered for lack of weather information, but the rural districts have been less fortunate, and the devising of plans by which the agricultural classes might receive the forecasts in time to guide them in their daily avocations has been a difficult problem.

The Bureau since its establishment has from time to time considered many methods by which the forecasts might be made to reach the agricultural classes in time to be of use, and aside from the efforts of its officials, suggestions from others interested in the subject have been numerous. A vast majority of the latter, however, from one cause or another, have been impracticable, so that after the thirty years of experience the Bureau accomplishes its distribution of forecasts and special warnings principally through (1) the newspapers; (2) the system of telegraphic distribution, at Government expense, under direct supervision of Weather Bureau station officials; (3) the voluntary cooperation of railroad and telephone companies, public spirited citizens, and postmasters.

The organization of the local State Weather Services during the eighties tended to augment the interest taken in this subject and resulted in the adoption of the systems that now give to nearly every part of the country having mail or telegraph facilities, daily forecasts and warnings of unusual weather conditions.

The country has been divided into districts with a center of distribution for each, from which the forecasts are telegraphed daily, except Sundays and holidays, to subcenters for redistribution by telephone, mail, or railway bulletin service. The distributing points receive predictions by telegraph or telephone usually by 10:30 or 11 a. m., seventy-fifth meridian time, and the substations served by mail get theirs within a few hours thereafter, depending upon distance and mail connections.

Independent of the distribution attained through the press, there are now published daily more than 100,000 weather bulletins, much the greater part being in the form of postal cards printed from the telegraphic report received by postmasters at distributing points and sent to the outlying towns for display in suitable holders in post offices and other prominent places. Postmasters at distributing offices are largely relied upon in making this distribution. By a simple printing device the franked cards are rapidly printed in bold type, and the earliest mails carry them quickly to their destination. Logotypes are used, comprising a vocabulary of about 125 of the popular weather terms in which the weather forecasts are usually expressed. The forecast cards are stamped in a very expeditious manner, it being possible for one person to print several hundred cards within a few minutes. In the whole experience of the Weather Bureau no system has been tried that has proved more effective or inexpensive than this extremely simple method of stamping the forecasts by hand on postal cards bearing the official frank.

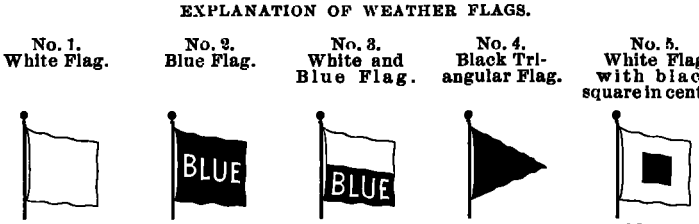
Other and older systems for conveying weather information have not been abandoned, viz, the flag displays and sound signals. The former consists of a series of five flags, which are displayed singly or in such combinations as to represent weather conditions. The sound signals are a code of steam whistle blasts which may be heard for miles in the country adjacent to the mill or factory sounding the same. This system is quite extensively used in some States, and has proved very popular. The code employed is the following:

A warning blast of from fifteen to twenty seconds duration is sounded to attract attention. After this warning the longer blasts (of from four to six seconds duration) refer to weather, and shorter blasts (of from one to three seconds duration) refer to temperature; those for weather are sounded first.

Blasts.	Indicate.
One long	Fair weather.
Two long	Rain or snow.
Three long	Local rain or snow.
One short	Lower temperature.
Two short	Higher temperature.
Three short	Cold wave.

By repeating each combination a few times, with intervals of ten seconds, liability to error in reading the signals may be avoided.

EXPLANATION OF WEATHER FLAGS.



When number 4 is placed above number 1, 2, or 3, it indicates warmer; when below, colder; when not displayed, the temperature is expected to remain about stationary. During the late spring and early fall the cold wave flag is also used to indicate anticipated frosts.

Quite a variety of methods other than the aforementioned have been tried from time to time, some giving much satisfaction, among which may be mentioned the plan of attaching to letter boxes a suitable frame, the card forecasts being placed therein by the letter carriers in making their rounds for the collection of mail. This system is in vogue in several cities and is very popular. The street cars are also used to a considerable extent, the forecasts being posted in the interior of the cars in bulletin form, and in some instances symbols representing the flags are displayed from the sides or tops of the cars.

Within the year 1900 there has been utilized what now promises to be one of the most effective methods of reaching the agricultural classes, viz, the rural free mail service. Wherever it has been possible to reach the distributing post office with the telegraphic forecasts in time to catch outgoing carriers the service has been given to farmers along their routes. By this means it has been possible to place in the hands of more than

400 farmers on a single route a copy of the official forecasts within a few hours after its issue. This new feature of the postal service is gaining in popularity and is being rapidly extended, and it will be utilized as fully as possible by the Weather Bureau. The forecast is stamped by the logotype system previously referred to upon a small slip of paper and a copy furnished each carrier on the rural carrier's route. To illustrate the form in which the forecast reaches the farmer the following specimen blank containing an ordinary forecast is reproduced:

Form No. 1049 A—Met'l.

WEATHER FORECAST.

PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.
Willis L. Moore, Chief U. S. Weather Bureau.

RAIN TO-NIGHT AND TUESDAY;
WARMER TO-NIGHT.

The increase that has been made in the distribution of the forecasts of the Weather Bureau since its transfer from the War Department to the Department of Agriculture is illustrated by the following table:

Distribution of daily forecasts, special and emergency warnings.

Year.	By telegraph or telephone, at Government expense.			Without expense to the Government, by—				Grand total.	Per cent of increase.
	Daily forecasts.	Special warnings.	Emergency warnings.*	Mail.	Telegraph or telephone.	Railroad telegraph.	Railroad train.		
1892	1,888	592	.....	639	533	1,204	1,462	6,368	....
1893	1,613	632	.....	3,065	620	2,129	1,264	9,323	46
1894	1,778	609	.....	4,361	947	2,219	1,818	11,232	21
1895	1,920	633	3,494	11,732	1,239	2,346	1,218	22,582	102
1896	1,581	790	3,494	22,642	1,712	3,550	1,999	35,503	57
1897	1,886	613	3,481	37,913	2,347	3,196	2,258	51,694	46
1898	2,093	592	3,461	50,032	2,623	3,354	2,505	64,675	25
1899	1,762	768	6,769	56,308	2,778	2,902	2,423	73,710	14
1900	1,857	791	7,096	76,593	8,297	3,314	2,423	100,371	36

*Emergency warnings go to all places receiving the ordinary forecasts and special warnings. This system of stations was established in 1895.

It is the desire of the Department to further increase the usefulness of the service wherever possible, and any community not now receiving the benefit thereof will have its interests carefully considered and served, if possible, upon application to the Weather Bureau official in charge of the territory in which such community may be situated. Communications in connection with this subject, addressed "U. S. Weather Bureau official in charge" (giving the name of the central station of the district in which the writer may be located), will receive prompt and considerate attention. These central stations and districts are as follows:

Montgomery, Ala.; Phoenix, Ariz.; Little Rock, Ark.; San Francisco, Cal.; Denver, Colo.; Jacksonville, Fla.; Atlanta, Ga.; Boise, Idaho; Springfield, Ill.; Indianapolis, Ind.; Des Moines, Iowa; Topeka, Kans.; Louisville, Ky.; New Orleans, La.; Baltimore, Md. (for Delaware and Maryland); Boston, Mass. (for New England); Lansing, Mich.; Minneapolis, Minn.; Vicksburg, Miss.; Columbia, Mo.; Helena, Mont.; Lincoln, Nebr.; Carson City, Nev.; New Brunswick, N. J.; Santa Fe, N. Mex.; Ithaca, N. Y.; Raleigh, N. C.; Bismarck, N. Dak.; Columbus, Ohio; Oklahoma, Okla. (for Oklahoma and Indian Territory); Portland, Oreg.; Philadelphia, Pa.; Columbia, S. C.; Huron, S. Dak.; Nashville, Tenn.; Galveston, Tex.; Salt Lake City, Utah; Richmond, Va.; Seattle, Wash.; Parkersburg, W. Va.; Milwaukee, Wis.; Cheyenne, Wyo.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made partly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological Observations at Honolulu, January, 1901.

The station is at 21° 18′ N., 157° 50′ W.
Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.
Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.
The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.
The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.
The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2.29 a. m., Honolulu time.								Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.93	69	62.5	.....	.....	56.7	69	nne.	0-3	10	30.00	29.92	0.00
2	29.91	63	59	77	66	58.3	62	nne.	1-3	0-1	29.99	29.85	0.00
3	29.90	62	60	77	62	59.3	72	w-ne.	1-0	1-3	29.97	29.86	0.00
4	29.88	69	66	75	60	61.7	83	s.	1-0	10-0	29.94	29.85	0.01
5	29.94	63	62.3	79	63	65.5	79	s.	1-0	3	29.96	29.87	0.00
6	29.94	65	63	77	63	64.3	83	s-ne.	1-0	4	30.00	29.90	0.00
7	29.97	69	66.5	80	65	64.0	75	sw-ne.	1-0	3-0	30.01	29.89	0.04
8	30.03	72	65	79	67	64.5	73	ne.	3	1-4	30.06	29.97	0.06
9	30.06	72	66	78	68	61.7	64	ne.	4	4	30.11	30.02	0.03
10	30.05	71	67	78	71	62.5	67	ene.	4-5	4	30.13	30.04	0.05
11	30.02	63	61.7	79	70	63.5	73	ne.	3	4-1	30.10	29.96	0.00
12	29.99	61	59	78	62	62.3	79	w.	0-1	0-1	30.06	29.96	0.00
13	30.02	68	66	79	60	61.5	73	sw-ne.	1-3	0-5	30.06	29.96	0.46
14	30.00	72	66	72	68	66.3	88	nne.	2-7	10	30.06	29.97	1.25
15	29.92	66	64	76	70	65.3	75	ne.	5-2	5	30.03	29.93	0.11
16	29.90	63	62.3	78	66	65.7	82	sw-w.	1	1-6	29.97	29.86	0.00
17	29.96	69	65	79	63	64.5	79	w-nne.	1	1-5	29.99	29.85	0.01
18	30.04	68	61	72	68	60.7	74	nne.	5-7	2	30.06	29.97	0.01
19	30.06	69	60	73	67	55.5	59	nne.	6-4	1	30.12	30.02	0.00
20	30.08	70	62.5	75	68	57.3	61	ne.	4-3	3	30.13	30.05	0.18
21	30.08	72	64	76	66	58.7	61	ne.	4-5	3	30.14	30.06	0.00
22	30.05	72	61	77	71	60.0	68	ne.	4	4	30.12	30.05	0.01
23	30.03	70	64	76	71	59.7	63	ne.	4	3	30.12	29.99	0.07
24	30.04	72	65	77	68	61.3	67	ne.	4	3	30.11	30.00	0.00
25	30.06	66	64.5	79	70	62.0	69	ne.	3	6	30.10	30.02	0.17
26	30.11	70	63.5	80	64	63.3	73	ne-s.	1	4	30.14	30.08	0.00
27	30.04	71	62.5	77	63	60.0	65	ne.	3-0	3	30.17	30.04	0.00
28	29.93	67	63.5	77	65	59.0	63	ne.	3	3	30.06	29.93	0.00
29	29.94	66	63	79	66	62.3	74	e-ne.	3	4	29.96	29.88	0.00
30	29.91	63	62	80	63	63.3	75	ne-s.	1	3	29.96	29.88	0.00
31	29.89	63	62	79	63	64.0	83	sw.	1	6	29.95	29.85	0.64
Sums.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.10
Means.	29.990	67.6	63.2	77.3	65.9	61.9	73	.....	2.4	3.6	30.05	29.95	—0.10
Departure.	+.049	.....	.....	.....	.....	—1.1	—3.7	.....	.....	—0.9	.....	.....	.....

Mean temperature for January, 1901 (6+2+9) ÷ 3 = 71.3; normal is 70.1. Mean pressure for January, 1901 (9+3) ÷ 2 = 29.998; normal is 29.949.
*This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡These values are the means of (6+9+2+9) ÷ 4. §Beaufort scale.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana, Director of the Central Meteorologic-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.